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Mites of the Genus *Gamasellus* BERLESE (Acari, Rhodacaridae) in Japan (I)

With 7 Text-figures

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ABSTRACT Six species belonging to the genus *Gamasellus* BERLESE are dealt with. Of these, four species are new to science, another is recorded for the first time from Japan, and the remaining one has previously been known from Japan.

The genus *Gamasellus* was proposed by BERLESE in 1892 for *Gamasus falciger* CANESTRINI, 1881, and was repeatedly dealt with by various authors, *e. g.*, WILLMANN (1936), HIRSCHMANN (1962), KARG (1971), BREGETOVA *et al.* (1977) and several others on European species, WOMERSLEY (1942) and LEE (1970) on Australian species, RYKE (1962) on South African and Texan species, EMBERSON (1967) on Canadian species, HURLBUTT (1979) on East African species, and so on. In Japan, its representative was first made known by the present author (ISHIKAWA, 1969), who reported *Gamasellus humosus* from Mt. Shigayama in Central Japan. In this paper, the author is going to describe four new species, *Gamasellus plumosus* sp. nov., *G. ezoensis* sp. nov., *G. venustus* sp. nov. and *G. lativentralis* sp. nov., and to record *G. montanus* WILLMANN for the first time from Japan.

The type-series and the other specimens used for this study are deposited in the collection of the Biological Laboratory, Matsuyama Shinonome Junior College, Matsuyama.

KEY TO THE SPECIES OF THE GENUS *Gamasellus* IN JAPAN

1. Prosomal shield provided with 21 pair of setae, all of which are plumose.... ..... *G. plumosus* sp. nov.
— Prosomal shield provided with 21 pair of setae, of which 3 to 5 pairs are plumose .....2.
2. Prosomal shield provided with 5 pair of plumose setae .....3.

— Prosomal shield provided with 4 or 3 pair of plumose setae .....4.
3. Opisthosomal shield provided with 4 pair of plumose setae.....
..... *G. montanus* WILLMANN.
— Opisthosomal shield provided with 5 pair of plumose setae.....
.....*G. ezoensis* sp. nov.
4. Prosomal shield provided with 4 pair of plumose setae.....
..... *G. humosus* ISHIKAWA.
— Prosomal shield provided with 3 pair of plumose setae .....5.
5. Opisthosomal shield provided with 4 pair of plumose setae.....
.....*G. venustus* sp. nov.
— Opisthosomal shield provided with 5 pair of plumose setae.....
..... *G. lativentralis* sp. nov.

Gamasellus plumosus sp. nov.

[Japanese name: Fusage-ainodani]

(Fig. 1)

Type-series. Holotype ♀ (MSJC–BL 159), allotype ♂, ex litter of *Fagus crenata*, Mt. Narabara (alt. 900 m), Ehime Pref., 23–XI–1968, K. ISHIKAWA. Paratypes: 2 ♀♀, ex decayed wood of *Fagus crenata*, Iwayaji, Kamiukena-gun, Ehime Pref., 1–VI–1969, M. SAKAI; 2 ♀♀, 1 ♂, ex litter of *Quercus mongolica* var. *grosseserrata*, Mt. Karakuni (alt. 1,300 m), Kagoshima Pref., 26–VII–1971, K. I.; 1 ♀, ex litter of *Rhododendron Kiusianum*, Mt. Takachiho (alt. 1,400 m), Kagoshima Pref., 27–VII–1971, K. I.

Female. Length of idiosoma av. 462.1 μm (432–478 μm); width at the level of humeral angles av. 272.1 μm (250–295 μm); brownish orange in color.

Prosomal shield (231–250 μm, av. 247.1 μm in length) sclerotized and ornamented with punctuations, and with reticulations in the posterior area, being provided with 21 pair of plumose setae. Opisthosomal shield (203–225 μm, av. 215.0 μm in length) reticulated and provided with 18 pair of plumose setae. Length of setae: j1 27.5 μm, z1 20.5 μm, j3 37.5 μm, r3 40.0 μm, J1 40.0 μm, J5 15.3 μm and Z5 42.5 μm.

Presternal shields consisting of 3 pair of platelets. Sternal shield 95.5 μm in length at midline, and bearing 4 pair of simple setae. Epigynial shield triangular, provided with a pair of simple setae. Ventri-anal shield (180 μm in length, 248 μm in width) reticulated, bearing 6 pair of preanal setae; Jv1 (15.2 μm) simple, Jv3 (26.5 μm) plumose, Zv2 (19.0 μm) weakly pilose, Zv3 (29.5 μm) plumose. Peritremes extending beyond coxae II. Epistome trispinate, median extension elongate and sharply pointed. Fixed digit of chelicera with 6 teeth and movable digit (52.5 μm) tridentate. Tarsus I with small claws and pulvilli; tarsi II to IV each with well developed claws and pulvilli.

Male. Length of idiosoma av. 431.2 μm, width of idiosoma at the level of

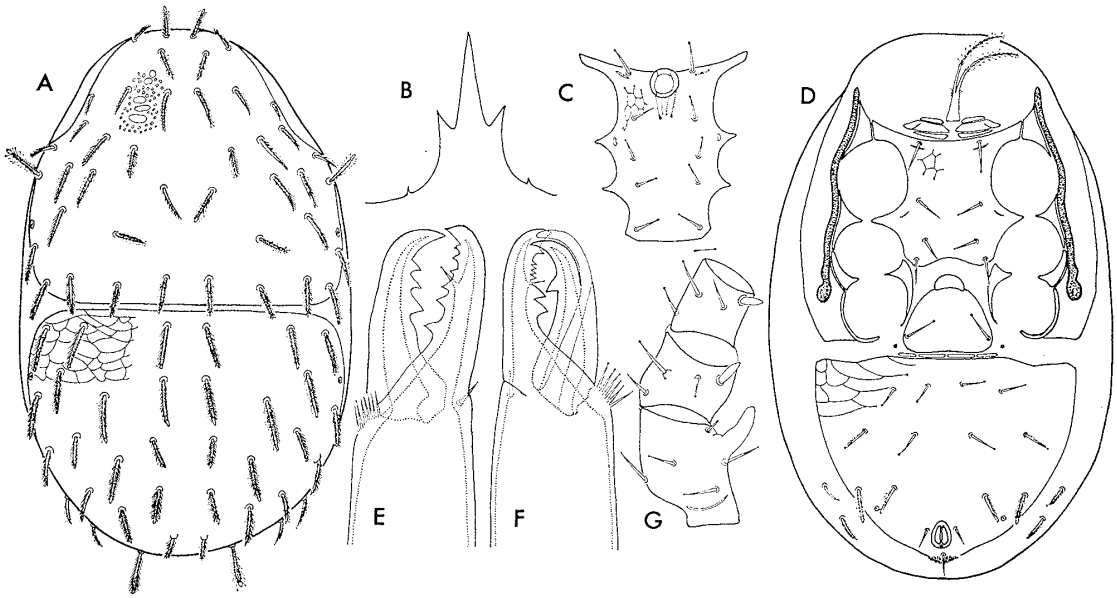

Fig. 1. *Gamasellus plumosus* sp. nov. (A–B, D–E: female: C, F–G, male). —— A, Dorsum; B, epistome; C, sterniti-genital shield; D, venter; E–F, chelicera; G, femur, genu and tibia II.

humeral angles av. 262.7 μm. Dorsal chaetotaxy and ornamentation similar to those of female. Sterniti-genital shield bearing 5 pair of simple setae. Fixed digit of chelicera with 2 large and 5 small teeth; movable digit (47.5 μm) unidentate, with spermatodactyl. Femur II with a thumb-like spur; a samll spur located on genu II and tibia II.

Notes. The present species can be readily distinguished from *G. peninsularis* ISHIKAWA, 1976, from the Malay Peninsula, by the following characteristics: prosomal and opisthosomal shields provided with 21 and 18 pair of plumose setae respectively, instead of each 22 pairs.

Gamasellus montanus (WILLMANN)

[Japanese name: Miyama-ainodani]

(Fig. 2)

Cyrtolaelaps montanus WILLMANN, 1936, Zool. Anz., **15**: 18.
Gamasellus montanus: HIRSCHMANN, 1962, Acarologie Schr.-Reihe vergl. Milbenk., (5): 49; BREGETOVA, 1977, Opredelitel' obitaiushchikh v pochve Kleshchei Mesostigmata, p. 300.

Specimens examined. Hokkaido: 1 ♀, ex litter of *Picea Glehnii*, Sôunkyô Valley (alt. 1,250 m), 6–VII–1970, K. MORIKAWA & K. ISHIKAWA; 1 ♀, ex *Betula Ermani*, Mt. Kurodake (alt. 1,500 m), 8–VII–1970, K. M. & K. I.; 1 ♀, ex *Sphagna*, Mt. OAKANDAKE (alt. 450 m), Akan, 5–IX–1976, J. OHNISHI; 5 ♀♀, ex litter of *Abies sachalinensis*, Higashi-misumai, Sapporo, 21–V–1968, T. FUJIKAWA.

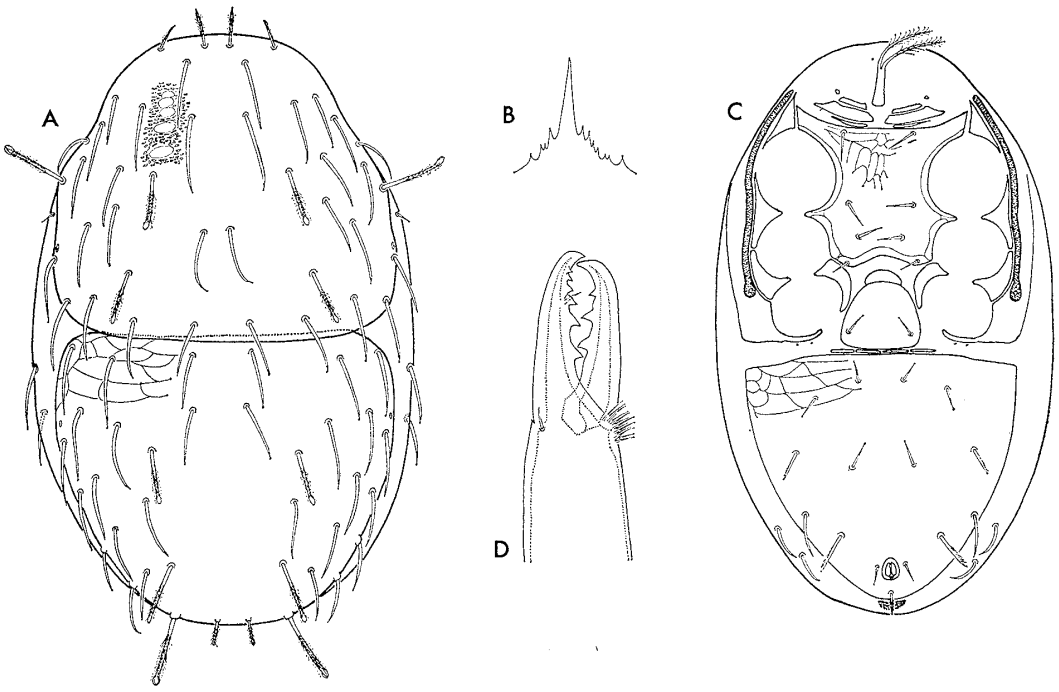

Fig. 2. *Gamasellus montanus* WILLMANN, female. —— A, Dorsum; B, epistome; C, venter; D, chelicera.

Diagnostic characters. Female. Length of idiosoma av. 705 μm, width at the level of humeral setae av. 364 μm. Prosomal shield finely reticulated, bearing 21 pair of setae, of which 5 pairs are plumose with rounded tips and the remainings simple. Opisthosomal shield reticulated and bearing 4 pair of plumose and 14 pair of simple setae. Ventri-anal shield (312 μm in length, 337 μm in width) provided with 6 pair of preanal setae; Jv1 (25.0 μm), Jv2, and Zv1 simple, Jv3 (51.5 μm) plumose, Zv2 weakly pilose and Zv3 (52.5 μm) slightly lanceolate. Epistome with a long median extension and several short spines on either side. Fixed digit of chelicera bearing 2 large and 4 small teeth, while movable digit (120 μm) is tridentate.

Notes. This species was originally described by WILLMANN (1936) from Schneeberg in West Germany. Since then, this species has been recorded from Europe to the Soviet Far East. This is the first record from Japan.

Gamasellus ezoensis sp. nov.

[Japanese name: Ezo-ainodani]

(Fig. 3)

Type-series. Holotype ♀ (MSJC–BL 160), allotype ♂, ex litter of *Pinus pumila*, Mt. Asahidake (alt. 1,600 m), Hokkaido, 6–VII–1970, K. MORIKAWA & K. ISHIKAWA. Paratypes: 15 ♀♀, 1 ♂, same data as the holotype; 3 ♀♀, 2 ♂♂, ex litter of *Pinus pumila*, Mt. Sharidake (alt. 1,300 m), Hokkaido, 29–VIII–1976, J. OHNISHI; 5 ♀♀,

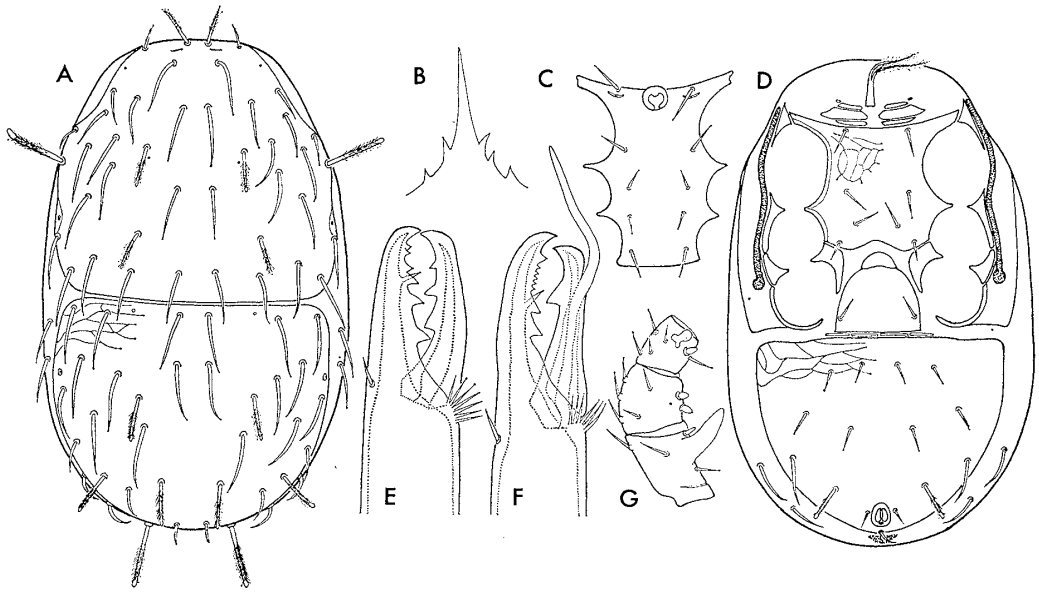

Fig. 3. *Gamasellus ezoensis* sp. nov. (A–B, D–E, female; C, F–G, male). —— A, Dorsum; B, epistome; C, sterniti-genital shield; D, venter; E–F, chelicera; G, femur, genu and tibia II

3 ♂♂, ex litter of *Picea Glehnii*, Mt. Oakandake (alt. 750 m), Hokkaido, 5–IX–1976, J. OHNISHI; 3 ♀♀, 2 ♂♂, ex litter of *Abies sachalinensis*, Choboshi (alt. 7 m), Nemuro, Hokkaido, 1–VII–1979, J. OHNISHI; 5 ♀♀, 1 ♂, ex litter of *Phragmites communis*, the morass of Kushiro, Hokkaido, 17–IV–1976, J. OHNISHI; 7 ♀♀, 2 ♂♂, ex litter of *Picea abies*, Misumai, Hokkaido, 20–V–1968, T. FUJIKAWA.

Female. Length of idiosoma av. 558.7 μm (520–585 μm): width at the level of humeral angles av. 320.0 μm (302–337 μm); brownish orange in color.

Prosomal shield (267–294 μm, av. 288.7 μm in length) reticulated, and provided with 21 pair of setae, of which 5 pairs are plumose and the remainings simple. Opisthosomal shield (249–286 μm, av. 263.1 μm in length) reticulated, and provided with 5 pair of plumose setae with rounded tips, and with 13 pair of simple setae. Length of setae: j1 35.0 μm, z1 22.5 μm, j3 64.5 μm, j4 47.5 μm, r3 66.0 μm, J1 61.0 μm, J5 21.0 μm and Z5 56.0 μm.

Presternal shield composed of 4 pair of platelets, of which the anterolateral pair is small. Sternal shield 130 μm in length at midline, and bearing 4 pair of simple setae. Ventri-anal shield (225 μm in length, 312 μm in width) reticulated, and provided with 6 pair of preanal setae, all setae being simple, except for plumose Jv3; Jv1 19.5 μm, Jv3 37.5 μm and Zv3 40.0 μm. Peritremes extending beyond coxae II. Epistome with a sharp extension at middle and several short spines on either side. Fixed digit of chelicera bearing 2 large and 4 small teeth, and movable digit (88 μm) tridentate. Tarsus I with small claws and pulvilli; tarsi II to IV each with well developed claws and pulvilli.

Male. Length of idiosoma av. 537.5 μm, width of idiosoma at the level of

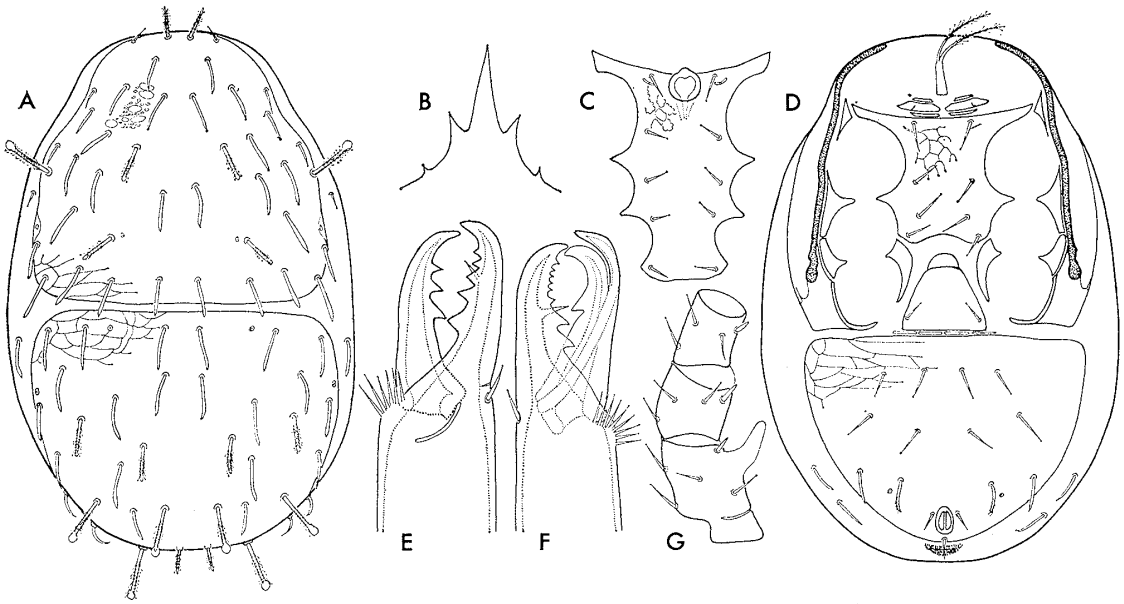

Fig. 4. *Gamasellus humosus* ISHIKAWA (A–B, D–E, female; C, F–G, male). —— A, Dorsum; B, epistome; C, sterniti-genital shield; D, venter; E–F, chelicera; G, femur, genu and tibia II.

humeral angles av. 295.0 μm. The chaetotaxy and ornamentation of dorsal shields are essentially the same as in female. Sterniti-genital shield provided with 5 pair of simple setae. Fixed digit of chelicera with 3 teeth and several minute teeth; movable digit (62.5 μm) unidentate, with spermatodactyl. Femur II with a heavy rounded and a small spurs, genu and tibia II each with 2 spurs.

Notes. The present species is easily distinguished from *Gamasellus montanus* WILLMANN, 1936, from Schneeberg in West Germany, by the setae S4 of opisthosomal shield plumose instead of simple. The present species and *G. montanus* have so far been collected only in Hokkaido.

Gamasellus humosus ISHIKAWA

[Japanese name: Ochiba-ainodani]

(Fig. 4)

Gamasellus humosus ISHIKAWA, 1969, Bull. natn. Sci. Mus., Tokyo, **12**: 48.

Specimens examined. 2 ♀♀, 1 ♂, ex litter of *Pinus Thunbergii*, Fukaura, Nishi-tsugaru-gun, Aomori Pref., 9–VIII–1968, S. CHIBA; 2 ♀♀, Mt. Hakkôda, Aomori Pref., 31–V–1964, M. TANAKA; 2 ♀♀, 2 ♂♂, ex litter of *Abies Mariesii*, Kefunoyu, Hachiman-tai, Akita Pref., 18–VIII–1968, S. CHIBA; 2 ♀♀, ex litter of *Aesculus turbinata*, Sandankyô Valley, Hiroshima Pref., 12–X–1968, K. ISHIKAWA; 2 ♀♀, ex moss in *Abies Veitchii shikokiana*, Mt. Ishizuchi (alt. 1,970 m), Ehime Pref., 8–VIII–1969, K. I.; 1 ♀, 1 ♂, ex litter of *Tsuga Sieboldii*, Omogo Valley, Ehime

Pref., 16–VI–1968, K. I.; 3 ♀♀, Mt. Nishiakaishi (alt. 1,600 m), Ehime Pref., 28–V–1969, K. I.; 2 ♀♀, ex litter of evergreen broadleaved forest, Mt. Hitsuzan, Kôchi Pref., 24–X–1968, K. I.; 3 ♀♀, 1 ♂, ex litter of evergreen broadleaved forest, Mt. Mitake (alt. 490 m), Kamigata, Tsushima Is., Nagasaki Pref., 18–X–1968, J. AOKI.

Diagnostic characters. Female. Length of idiosoma av. 492 μm, width at the level of humeral angles av. 273 μm. Prosomal shield finely punctate, bearing 21 pair of setae, of which 4 pairs are plumose with rounded tips and the remainings slightly lanceolate except for simple Z1. Opisthosomal shield reticulated and provided with 6 pair of plumose and 12 pair of slightly lanceolate setae.

Ventri-anal shield provided with 6 pair of preanal setae: Jv1, Jv2, Zv1 and Zv2 simple; Jv3 35.0 μm, plumose and Zv3 36.0 μm, slightly lanceolate. Peritremes extending anteriorly beyond coxae I. Epistome trispinate, median one much longer than the laterals. Fixed digit of chelicera provided with 6 teeth and a pilus dentilis, movable digit (61.5 μm) tridentate.

Male. Length of idiosoma av. 460 μm, width of idiosoma at the level of humeral angles av. 255 μm. Dorsal chaetotaxy and ornamentation similar to those of female. Sterniti-genital shield with 5 pair of simple setae. Fixed digit of chelicera with 2 large and 4 small teeth; movable digit (57.5 μm) unidentate, with spermatodactyl. Femur II with a large thumb-like and a small spurs; genu and tibia II each with a small spur.

Notes. This species was originally described by the author (ISHIKAWA, 1969) from the subalpine forest on Mt. Shigayama, Central Japan, and after that recorded from Honshu, Shikoku and the Tsushima Islands.

Gamasellus venustus sp. nov.

[Japanese name: Machigasawa-ainodani]

(Fig. 5)

Type-series. Holotype ♀ (MSJC–BL 161), ex litter of *Fagus crenata*, Machigasawa, Mt. Tanigawa, Gunma Pref., 17–XI–1976, J. AOKI. Paratypes: 1 ♀, same data as the holotype.

Female. Length of idiosoma in 2 specimens 385 μm and 380 μm, width at the level of humeral angles 198 μm and 195 μm; brownish orange in color.

Prosomal shield (205 μm, 200 μm in length) reticulated, bearing 21 pair of setae, of which 3 pairs are plumose with rounded tips, and the remainings simple. Opisthosomal shield (187 μm, 185 μm in length) reticulated, and provided with 4 pair of plumose setae with rounded tips, and also with 14 pair of simple setae. Length of setae: j1 17.5 μm, z1 12.5 μm, j3 48.0 μm, j4 32.5 μm, r3 41.0 μm, J1 42.2 μm, J5 31.5 μm and Z5 37.0 μm.

Three pair of presternal shields present. Sternal shield 87.5 μm in length at midline, and provided with 4 pair of simple setae. Epigynial shield gently rounded posteriorly, and provided with a pair of simple setae. Ventri-anal shield (150 μm

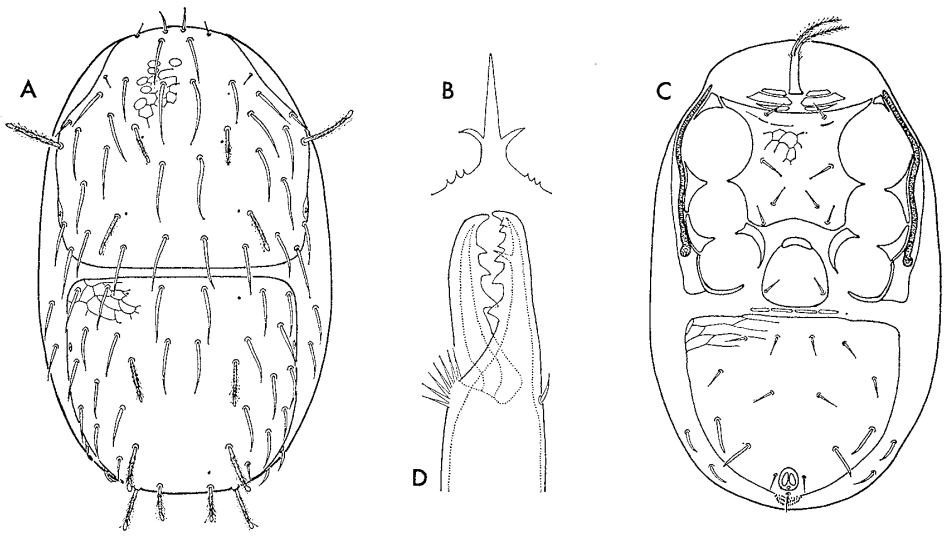

Fig. 5. *Gamasellus venustus* sp. nov., female. —— A, Dorsum; B, epistome; C, venter; D, chelicera.

in length, 177 μm in width) reticulated, and bearing 6 pair of preanal and 3 perianal setae, all setae being simple; Jv1 14.5 μm, Jv3 22.5 μm and Zv3 25.0 μm. Peritremes extending beyond coxae II. Epistome trispinate, median extension distally pointed. Fixed digit of chelicera provided with 6 teeth, while movable digit (55.0 μm) is tridentate. Tarsus I with small claws and pulvilli; tarsi II to IV each with well developed claws and pulvilli.

Notes. The prosomal setae j1 and z1 are simple in both the present species and *G. lativentralis*, and on the other hand, those of the remaining gamasellid mites in Japan are plumose. The present species can be readily separated from *G. lativentralis* by the following characteristics: setae S4 of opisthosomal shield are simple, instead of plumose; ventri-anal shield slightly wider than long, instead of being extremely wider than long.

Gamasellus lativentralis sp. nov.

[Japanese name: Daisen-ainodani]

(Fig. 6)

Type-series. Holotype ♀ (MSJC–BL 162), allotype ♂, Mt. Daisen, Tottori Pref., 29–IX–1969, the litter sample was collected by T. OKUMURA and extracted by K. KUROSA. Paratypes: 1 ♀, 1 ♂, same data as the holotype.

Female. Length of idiosoma 437 μm and 430 μm, width at the level of humeral angles 250 μm and 245 μm, brownish orange in color.

Prosomal shield (230 μm, 226 μm in length) reticulated, bearing 21 pair of setae, of which 3 pairs are plumose with rounded tips and the remainings simple. Opisthosomal shield (187 μm, 183 μm in length) reticulated, and provided with 5 pair

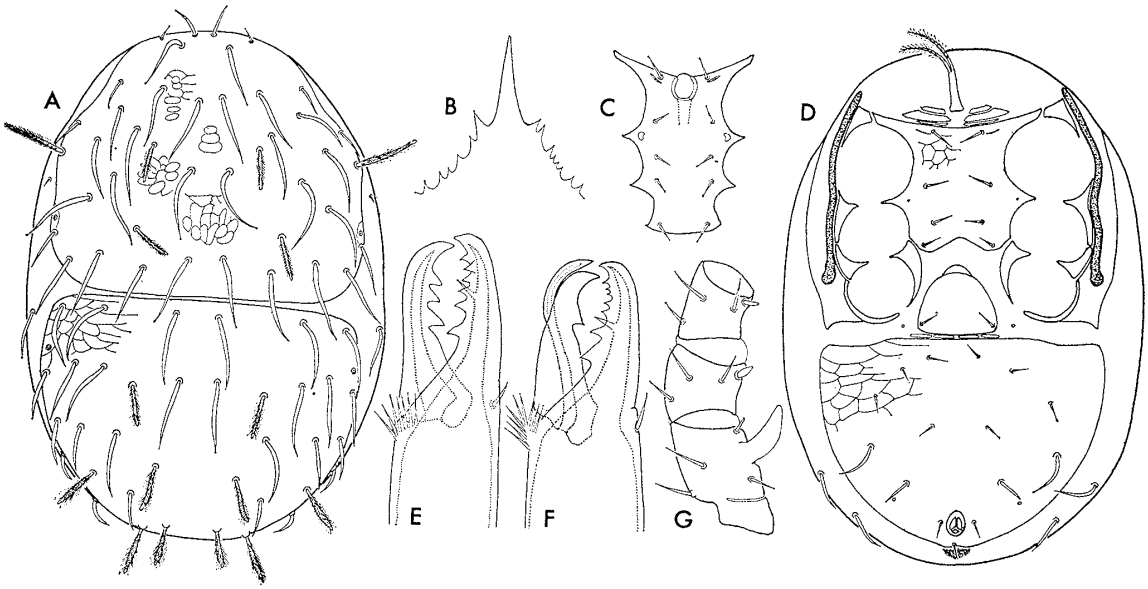

Fig. 6. *Gamasellus lativentralis* sp. nov. (A–B, D–E, female; C, F–G, male). —— A, Dorsum; B, epistome; C, sterniti-genital shield; D, venter; E–F, chelicera; G, femur, genu and tibia II.

of plumose setae with rounded tips, and also with 13 pair of simple setae. Length of setae: j1 20.0 μm, z1 12.5 μm, j3 65.4 μm, j4 36.7 μm, r3 53.0 μm, J1 63.0 μm, J5 30.2 μm and Z5 42.6 μm.

Three pair of presternal shields narrow. Sternal shield 95 μm in length at midline, and bearing 4 pair of simple setae. Ventri-anal shield (197 μm in length, 220 μm in width) reticulated, and provided with 6 pair of preanal and 3 perianal setae; Jv1 12.0 μm, Jv3 20.5 μm and Zv3 37.7 μm. Peritremes extending beyond coxae II. Epistome with an elongate, distally pointed median extension and several short spines on either side. Fixed digit of chelicera provided with 6 teeth, while movable digit (55 μm) is tridentate. Tarsus I with small claws and pulvilli; tarsi II to IV each with well developed claws and pulvilli.

Male. Length of idiosoma 415 μm and 412 μm, width of idiosoma at the level of humeral angles 225 μm and 220 μm. The chaetotaxy and ornamentation of dorsal shields are as in female. Sterniti-genital shield bearing 5 pair of simple setae. Fixed digit of chelicera with 2 large and 5 small teeth; movable digit (48 μm) unidentate, and with spermatodactyl. Femur II with a heavy rounded spur ventrally, genu and tibia II each with a small ventral protuberance.

Notes. In the conformation of the dorsal setae j1 and z1, this new species seems most closely related to *G. venustus*, whose known distribution is limited to Mt. Tanigawa, but is distinguished from that species by having the setae S4 of opisthosomal shield plumose. It is interesting that the present species has so far been collected only on Mt. Daisen of western Japan.

DISCUSSION

The speciemsn used for this study are extracted from samples taken at more than 800 localities, distributed all over Japan, from Hokkaido to Kyushu. As the result, 6 species of gamasellid mites are found to occur in Japan. Most interesting is that 5 out of the 6 species are endemic to the Japanese Islands. *Gamasellus montanus* has been recorded from Western Europe to East Siberia and Hokkaido in Japan. *Gamasellus ezoensis* bears a strong resemblance to *G. montanus*, though it has been collected only in Hokkaido of Northeast Japan. *Gamasellus humosus* was first collected by the author on Mt. Shigayama, Central Japan, and since then this species has been recorded from various parts of Honshu, Shikoku and the Tsushima Islands, but not from Hokkaido. The occurrence of the two species, *G. venustus* and *G. lativentralis*, is much limited; the former has been known only from Mt. Tanigawa, Gunma Pref., and the latter only from Mt. Daisen, Tottori Pref. Finally, *G. plumosus* has been known from Shikoku and Kyushu. It can be readily separated from the remaining Japanese species by the form of dorsal setae, and is closely related to *G. peninsularis* ISHIKAWA, 1976, from the Malay Peninsula and an undetermined species from Kalimantan, Borneo, in the form of dorsal setae. It is, therefore, probable that this species arose in tropical Asia.

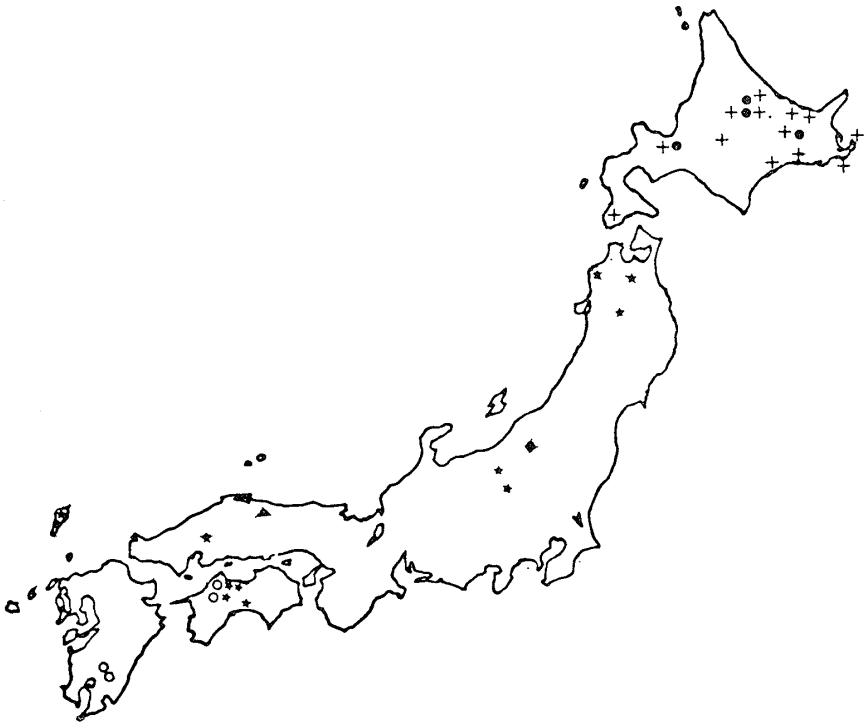

Fig. 7. Distribution of *Gamasellus* in Japan. —— ○ — *G. plumosus* sp. nov.; ● — *G. montanus* WILLMANN; + — *G. ezoensis* sp. nov.; ★ — *G. humosus* ISHIKAWA; ◆ — *G. venustus* sp. nov.; ▲ — *G. lativentralis* sp. nov.

Acknowledgement

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